TEXAS WATER DASHBOARD: CONNECTING MORE THAN DOTS

USGS

OVERVIEW

Case Study: Memorial Day Flooding 2015

What were Web Analytics telling us?

Full-frame Mapping Application

Data Distribution using Twitter

'Internet of Water' Concept (w/IBWC)

Joe Vrabel, Justin Robertson, Ramona Neafie, Florence Thompson, Deanna Terry, TXWSC Management and Staff

USGS

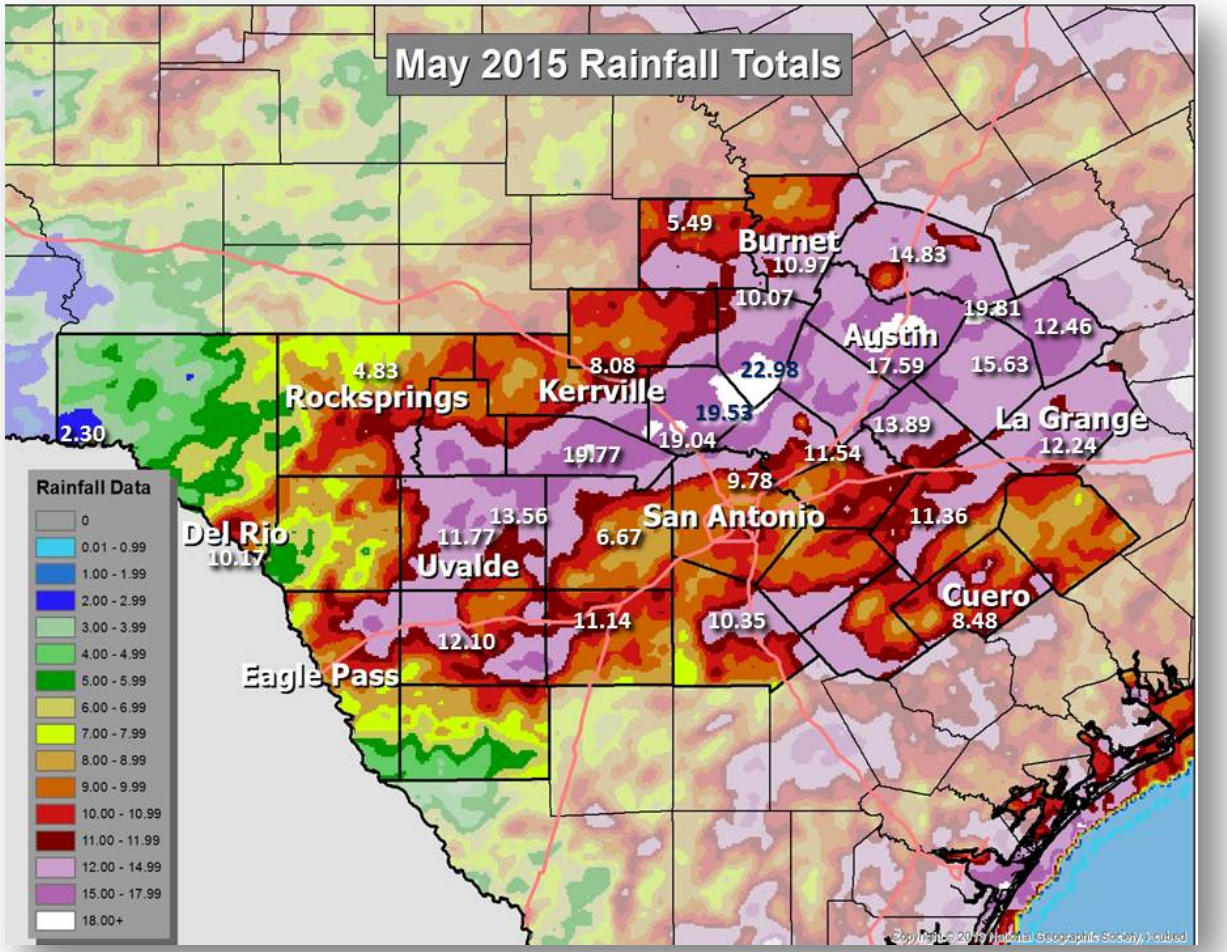
FOUNDATIONAL STATEMENTS

- All data streams used currently available to the public (QC'd, filtered data via NWISWeb Web services)
- Twitter development is all currently 'production', stable since July 2015
- Backend architecture was built to support tools (internal and external facing components) at the state and national scale
- Data from USGS updated every minute, every 5 minutes for partners (push-pull services)

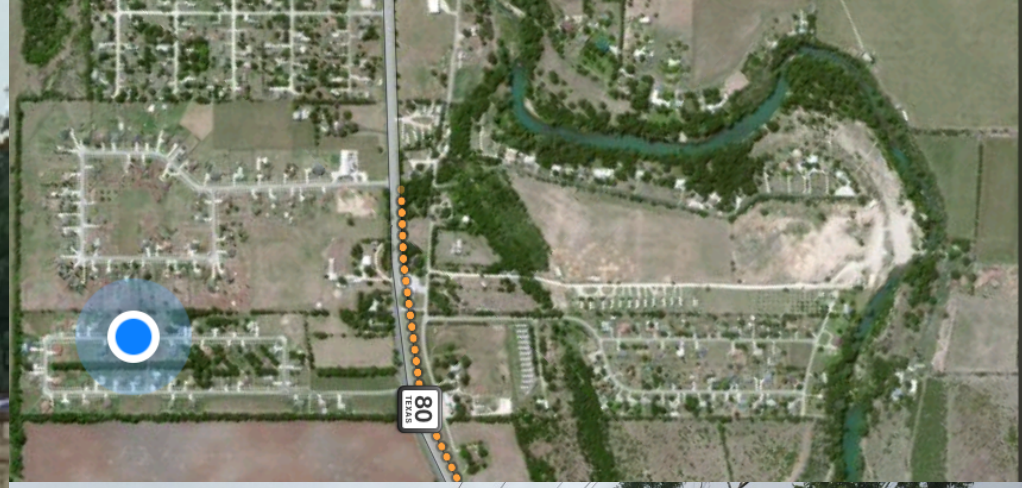
USGS

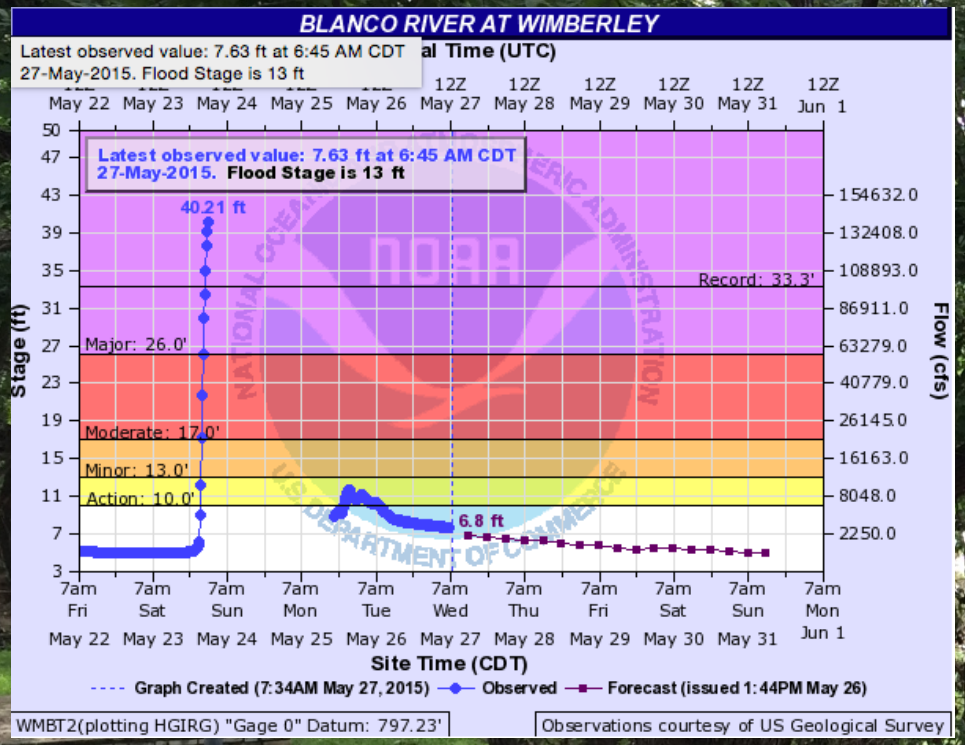
CASE STUDY: MEMORIAL DAY FLOODING 2015

- Wet conditions from early rains in May, increased runoff potential
- 12-13” in 4-6 hours
- Blanco River went from 5ft to 41ft in 4 hours
- >10 fatalities



USGS


80


BLANCO RIVER AT WIMBERLEY
Latest observed value: 7.63 ft at 6:45 AM CDT
27-May-2015. Flood Stage is 13 ft
al Time (UTC)
May 22 May 23 May 24 May 25 May 26 May 27 May 28 May 29 May 30 May 31 Jun 1
12Z
Latest observed value: 7.63 ft at 6:45 AM CDT
27-May-2015. Flood Stage is 13 ft
40.21 ft
6.8 ft
Record: 33.3'
Major: 26.0'
Moderate: 17.0'
Minor: 13.0'
Action: 10.0'
Stage (ft)
Flow (cfs)
50 47 43 39 35 31 27 23 19 15 11 7 3
154632.0 132408.0 108893.0 86911.0 63279.0 40779.0 26145.0 16163.0 8048.0 2250.0
7am Fri May 22
7am Sat May 23
7am Sun May 24
7am Mon May 25
7am Tue May 26
7am Wed May 27
7am Thu May 28
7am Fri May 29
7am Sat May 30
7am Sun May 31
7am Mon Jun 1
Site Time (CDT)
Graph Created (7:34AM May 27, 2015)
Observed
Forecast (issued 1:44PM May 26)
WMBT2(plotting HGIRG) "Gage 0" Datum: 797.23'
Observations courtesy of US Geological Survey

CONFUSION: WHERE IS THE BIG PICTURE?

Current conditions

- USGS streamgage webpages (4 upstream, *now 10*)

Forecast conditions

- NWS AHPS webpages (1 upstream, *now 6*)
- Weather conditions (TWC, NWS, WU)

Real-time or crowdsourced information

- Twitter - NWS, USACE, TDEM, Local Emergency Management, Local Governments, TX Storm Chasers

How can we bring this all together?

USGS

MEMORIAL DAY FINDINGS (MAY 22-30, 2015)

- There was a rapid and dramatic increase in web traffic (2X weekly average)
- For the TXWSC, traffic came primarily from new users. Lake/Reservoir data actually more popular than streamflow
- 40% of users were on a mobile device!
- Top search terms (in order): Maps of Texas flooding, Texas flooding map, Map of flooding in Texas, USGS water data, Medina Lake, Texas streamflow

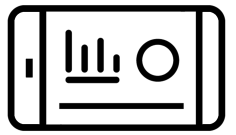
USGS

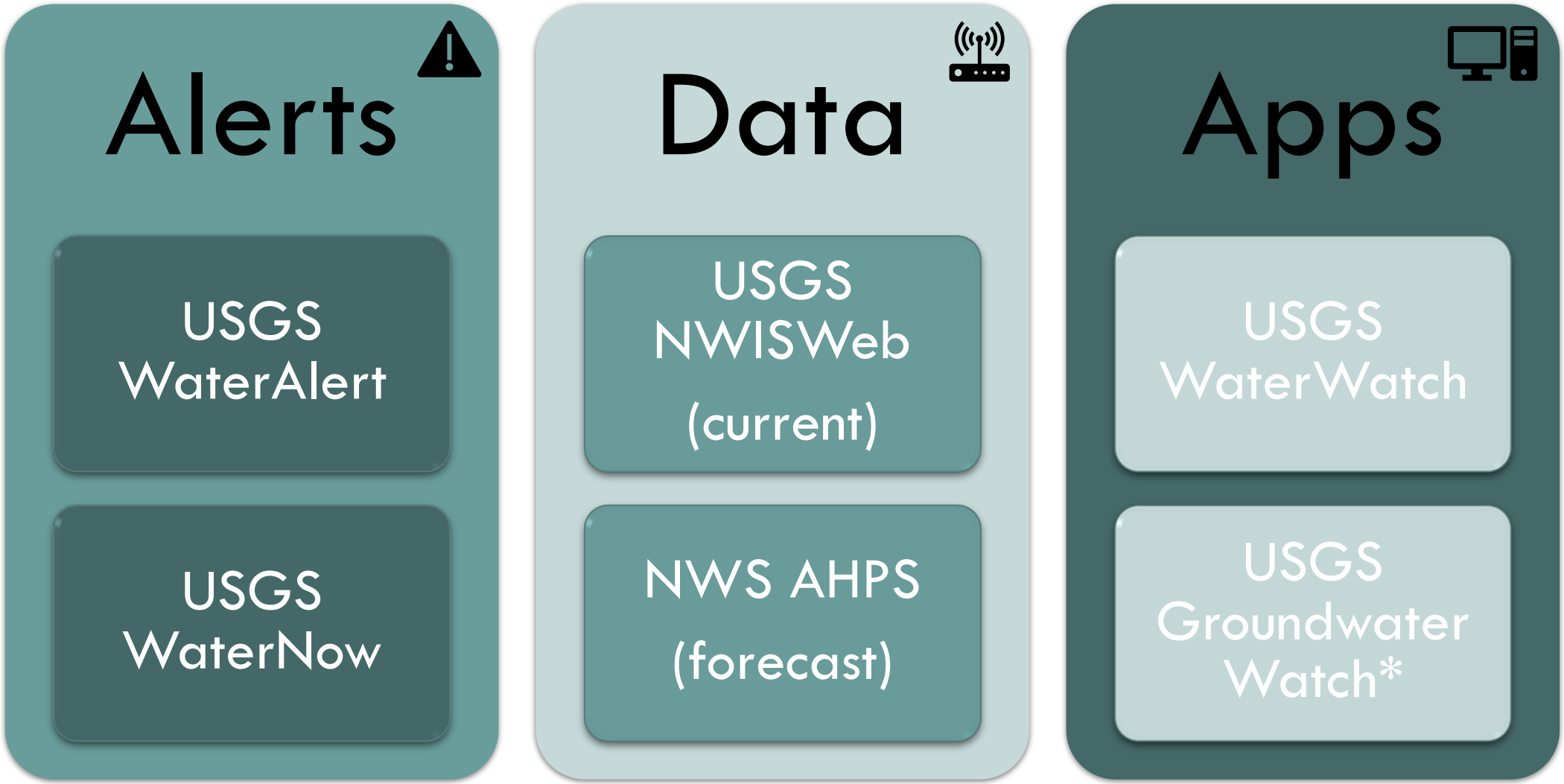
Suggested Improvements	
Satisfaction	Comment
85	List pool levels on real time lake/reservoir level charts.
89	definitions improvements;ie what does "owc" mean?
89	Allow user to pick 5-10 "favorites" that would come up in a dashboard type report.
93	**Zoomable map of Texas and gauge links.**
93	designate normal lake level on text portion
96	tutorial for gauge data & interpretation
100	I would like more numbers of cfs flows and times
100	have a tab just for lake levels showing the full capacity level and a + or - feature
100	**Advertise more! Everyone needs to know where they can get exact information without waiting for the news.**
85	measure precipitation at more locations. when I have the upstream and downstream results, I can more accurately approximate for our property.
74	compare flood stage to current data in larger text format
74	easier link to gage descriptions
74	**Show results more often than hourly, when heavy weather is occurring.**
67	Having the data closer to the top of the page.
63	Clearer links/descriptions to help get to a page quicker
44	**Should have lake level relative to normal level.**
74	could just spell out flood stage levels to current levels
67	The river basins are not listed in alphabetial order, so I needed to scroll through to find the one I was looking for.
63	**Clearer instructions/links to locations**
56	Need to know the Ac/Ft in the reservoirs. Only a few sites have this information.
44	cannot tell flood stage of lakes. Should have level relative to normal level.
89	Allow another level of map zooming. It would be helpful for big states (like Texas - where I live) to be able to zoom to an intermediate level such as the county rather than directly from the state to the individual station.

Top Gage Pages

		PageViews
08167500	Guadalupe Rv nr Spring Branch, TX	22,453
08088500	Possum Kingdom Lk nr Graford, TX	20,178
08179500	Medina Lk nr San Antonio, TX	19,211
08114000	Brazos Rv at Richmond, TX	16,235
08195000	Frio Rv at Concan, TX	16,025
08154500	Lk Travis nr Austin, TX	14,602
08167700	Canyon Lk nr New Braunfels, TX	13,943
08167800	Guadalupe Rv at Sattler, TX	13,314
08143000	Lk Brownwood nr Brownwood, TX	12,856
08168500	Guadalupe Rv abv Comal Rv at New Braunfels, TX	10,680
07314800	Lk Arrowhead nr Henrietta, TX	10,322
07227900	Lk Meredith nr Sanford, TX	10,293
08171000	Blanco Rv at Wimberley, TX	10,276
08086400	Hubbard Ck Res nr Breckenridge, TX	10,205
08090800	Brazos Rv nr Dennis, TX	9,625
08116650	Brazos Rv nr Rosharon, TX	9,526

We are partly to blame for the confusion….





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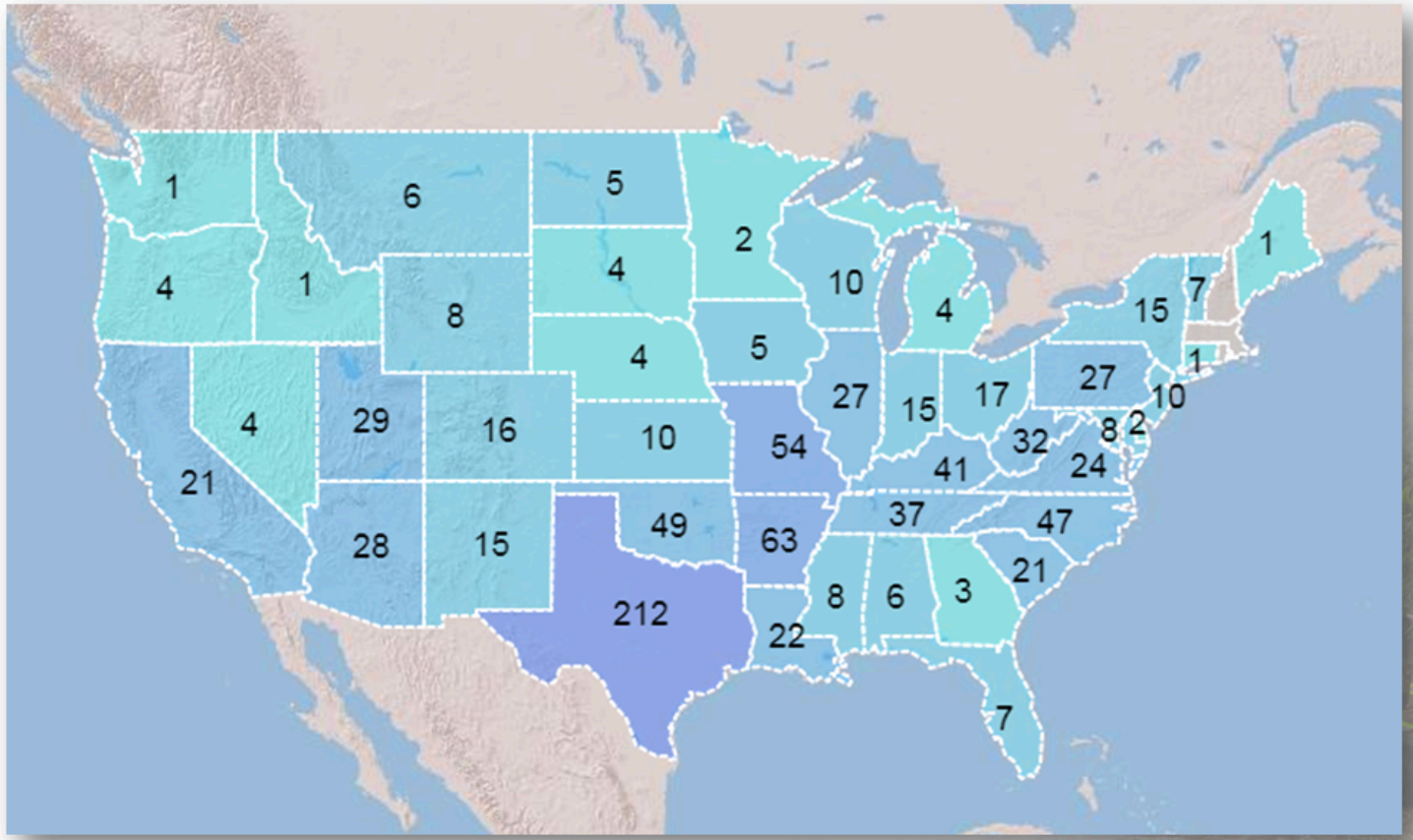
SUPPORTING DECISION SUPPORT

USGS

THE MOTIVATION

2010-2018 U.S. Flood Fatalities



Source: NOAA/National Weather Service

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APPROACH: LISTEN, LEARN, DEPLOY, EVOLVE

1. **LISTEN:** Identify key functions needed to simplify message to cooperators and public
2. **LISTEN:** Reduce the number of standalone applications, combine where possible
3. **LISTEN:** FOCUS ON THE 'NOW'!
4. **LEARN:** Make the system living/breathing website, become a 'hub'
5. **LEARN:** Connect w/partner agencies, leverage authoritative datasets
6. Test, **DEPLOY**, gather data, **EVOLVE.**

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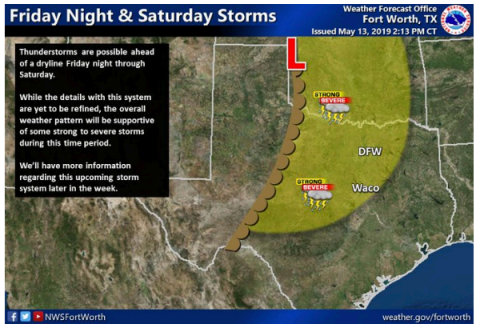
science for a changing world

Twitter | Layers | Legend 5

NWS Fort Worth
@NWSFortWorth

After a quiet week, storms will return this weekend when a dryline moves in from the west. Details about the storms are unclear at this time, but the pattern suggests that strong/severe storms will be possible. Keep checking back for updates through the week. #txwx #dfwwx #ctxwx



4m

USGS TX FloodWatch
@USGS_TexasFlood

#USGS08044500 - W Fk Trinity Rv nr Boyd, TX
Height: 16.76ft ▼ (16ft)
Flow: 2530cfswaterdata.usgs.gov/tx/nwis/uv?sit…

7m

USGS TX FloodWatch
@USGS_TexasFlood

#USGS08041000 - Neches Rv at Evadale, TX
Height: 17.41ft ▲ (17ft)
Flow: 24100cfswaterdata.usgs.gov/tx/nwis/uv?sit…

7m

USGS TX FloodWatch
@USGS_TexasFlood

#USGS08040600 - Neches Rv nr Town Bluff, TX

Clear Map | River Report | About

Search for a place

Base Map

08171000 Blanco Rv at Wimberley, TX
Surface-Water Site (Stream)

View Graph
Real-Time Streamflow
498 cubic feet per second
2019-05-13 21:15:00 CDT
Much Above Normal for this Day-of-Year

View Graph
Real-Time Stream Stage
5.19 feet
2019-05-13 21:15:00 CDT
Decreasing 0.04 feet per hour

More Data | Subscribe | Close

USGS Streams: Status Remove

All-Time Low for this Day	0th percentile (minimum)
Much Below Normal	<10th percentile
Below Normal	10th – 24th percentile
Normal	25th – 75th percentile
Above Normal	76th – 90th percentile
Much Above Normal	>90th percentile
All-Time High for this Day	100th percentile (maximum)
Not Flowing	0 cubic feet per second
Above NWS Flood Stage	See Comments
Not Ranked	See Comments

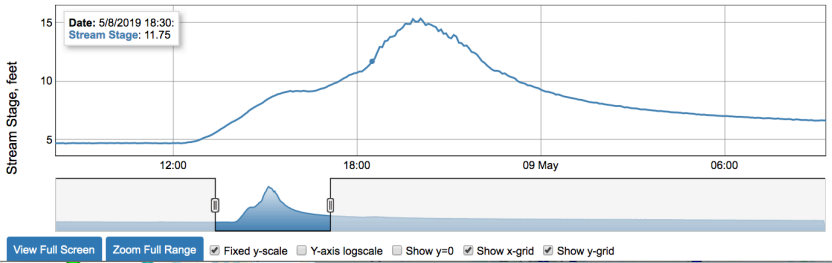
Comments: Marker color indicates the current streamflow condition. Categories are based on the percentile of existing streamflow record on this day-of-the-year. A streamgage is not ranked when there is less than 20 years of record or a current streamflow measurement is unavailable. Flood stages are maintained by the National Weather Service (NWS) and are not established for all USGS streamgages.

Data Source: USGS Water Data for the Nation

Click points to access real-time data, time-series graphs, and station information.

USGS - GWIS Plot Service
https://txpub.usgs.gov/dss/gwis/0.0/services/plot?range_selector=true&date_window=15&contr...

08171000 Blanco Rv at Wimberley, TX



100 km
50 mi

Scale: 1 : 2,311,162 Lat: 29.9835 Lon: -98.0859

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Twitter | Layers | Legend 6

USGS Observation Stations

- Streams 637 sites
- Lakes
- Wells
- Water Quality
- Rain
- Station Cams 12 sites

On

Real-time camera images

Opacity: 100%

Click points to view the most recent photo taken.

Weather Conditions

- Hazards 65 hazards
- Radar shown
- Recent Rainfall
- Rainfall Forecast
- Cloud Cover
- Temperature and Drought

Clear Map | River Report | About

Search for a place

Base Map

08073500 Buffalo Bayou nr Addicks, TX

Surface-Water Site (Stream)

View Graph

Real-Time Streamflow
2320 cubic feet per second
2019-05-13 10:15:00 CDT
Much Above Normal for this Day-of-Year

View Graph

Real-Time Stream Stage
56.44 feet
2019-05-13 10:15:00 CDT
Increasing 0.24 feet per hour

More Data | Subscribe | Close

Scale: 1 : 36,112

Humble, Jersey Village, Katy, Cinco Ranch, Houston, Pasadena, Meadows Place, Sugar Land, Richmond, Fresno

Station Cam

08072600 Buffalo Bayou at State Hwy 6 nr Addicks, TX

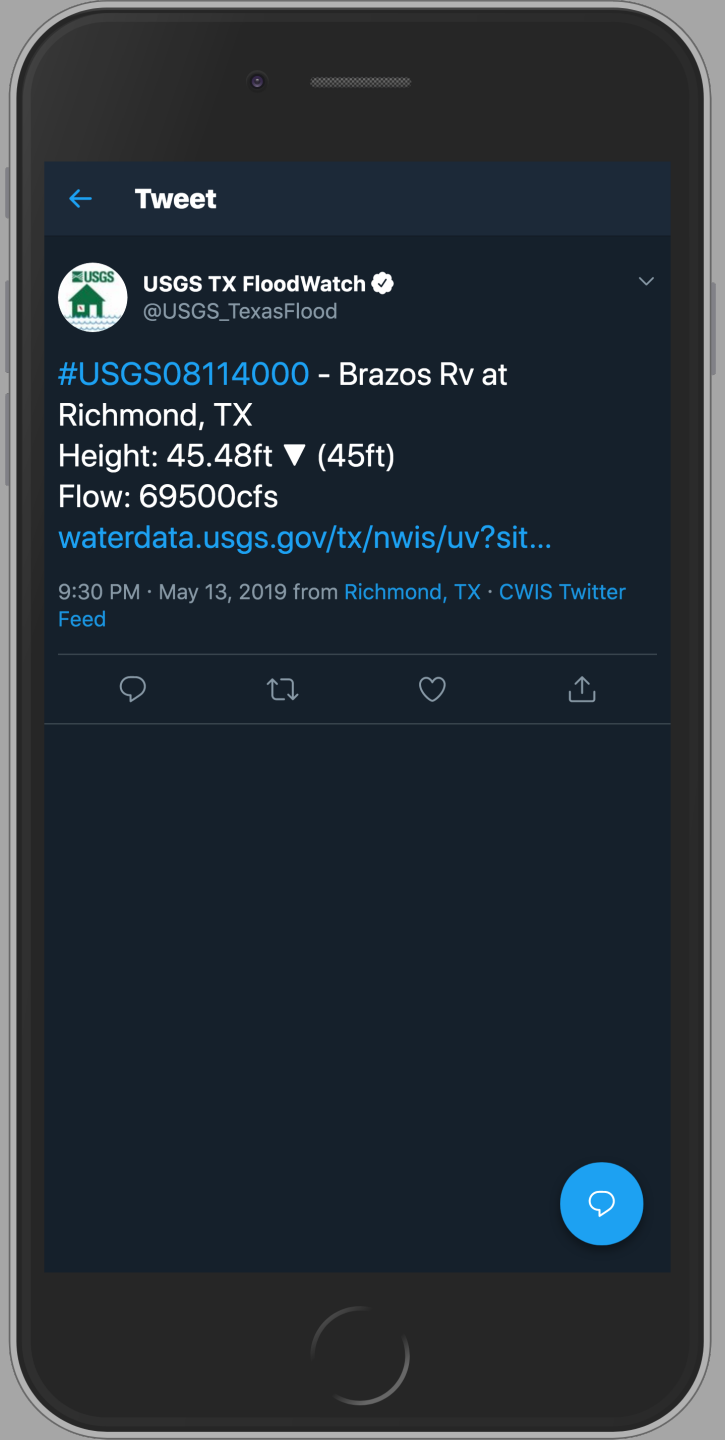
More Data | Site Info | Close

Clear Map | River Report | About

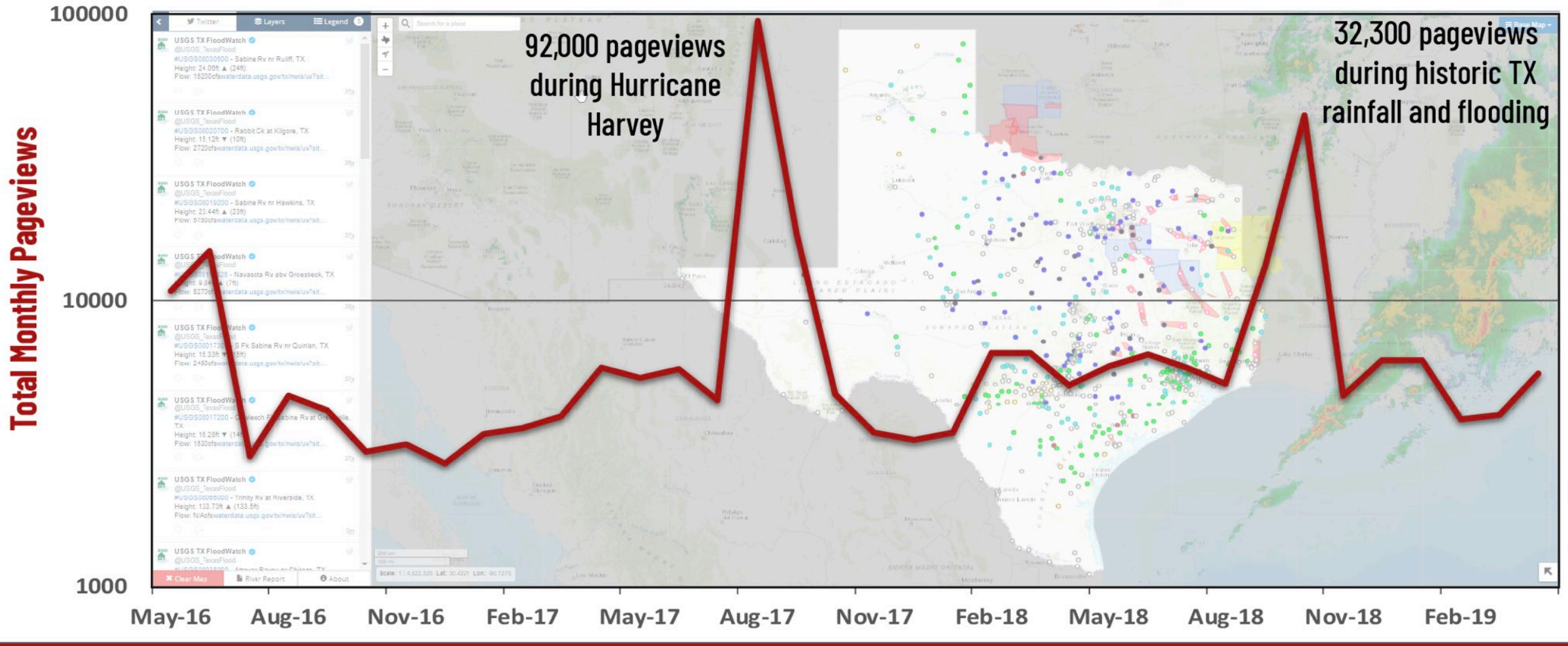
Scale: 1 : 36,112


USGS TX FloodWatch
114.6K Tweets
Following
USGS TX FloodWatch
@USGS_TexasFlood
290 @USGS_Texas real-time streamgages have flood stage defined by @NWS. This autonomous feed delivers river stage/discharge data for sites above flood stage.
Texas, USA txpub.usgs.gov/txwaterdashboa...
Joined March 2016
1 Following 1,479 Followers
Followed by Jennifer T. Wilson, Toby Welborn, and 37 others you follow
Tweets
Tweets & replies
Media
Likes
Pinned Tweet
USGS TX FloodWatch @USGS_T... · May 9
Explanation of a @USGS_TexasFlood tweet. #USGS streamgage information and current water information for sites above @NWS flood stage sent direct to your mobile device. #txflood #txwater #txwx #bewateraware
USGS TX FloodWatch @USGS_TexasFlood
#USGS08066250 - Trinity Rv nr Goodrich, TX


USGS TX FloodWatch
114.6K Tweets
Pinned Tweet
USGS TX FloodWatch @USGS_T... · May 9
Explanation of a @USGS_TexasFlood tweet. #USGS streamgage information and current water information for sites above @NWS flood stage sent direct to your mobile device. #txflood #txwater #txwx #bewateraware
USGS TX FloodWatch @USGS_TexasFlood · 28m
#USGS08066250 - Trinity Rv nr Goodrich, TX
Height: 38.41ft ▲ (36ft)
Flow: 81900cfs
waterdata.usgs.gov/tx/nwis/uv?sit...
USGS TX FloodWatch EXPLANATION
USGS station name and number
Most recent level ▲ Rising ▼ Falling (NWS flood stage)
Most recent flow
2
USGS TX FloodWatch @USGS_Texa... · 3m
#USGS08116650 - Brazos Rv nr Rosharon, TX
Height: 50.56ft ▼ (43ft)
Flow: 72000cfs
waterdata.usgs.gov/tx/nwis/uv?sit...
USGS TX FloodWatch @USGS_Texa... · 3m
#USGS08065000 - Trinity Rv nr Oakwood, TX
Height: 42.8ft ▲ (35ft)
Flow: 39900cfs
waterdata.usgs.gov/tx/nwis/uv?sit...


Tweet
USGS TX FloodWatch
@USGS_TexasFlood
#USGS08114000 - Brazos Rv at Richmond, TX
Height: 45.48ft ▼ (45ft)
Flow: 69500cfs
waterdata.usgs.gov/tx/nwis/uv?sit...
9:30 PM · May 13, 2019 from Richmond, TX · CWIS Twitter Feed

Texas Water Dashboard Usage



https://txpub.usgs.gov/txwaterdashboard/

CAN NWIS BECOME A ‘MASHUP’?

SPIRIT OF THE 'INTERNET OF WATER'

Connecting Water Data to Improve Outcomes

"When it comes to water, critical decisions are made every day, regardless of data availability. But what if we could harness more data to make better informed decisions? This is our end goal. The Internet of Water seeks to fundamentally change how we manage water by improving access to more water data for real-time decision-making."

More: https://internetofwater.org/

Internet of Water

WHAT ABOUT THE RIO GRANDE? *PILOT EFFORT

- Water data along the Rio Grande is responsibility of US State Department, IBWC
- High flood potential via Rio Conchos
- Can we consider NWIS a 'mashup'? (IBWC access via Aquarius API)
- Use our powerful database as a distribution vehicle only?
- Fully leverage NWISWeb and USGS Water webservices
- Add Rio Grande data to the Texas Water Dashboard
- Partner building with cooperators
- Access to real-time water conditions for up to 2M additional Texans!!!

https://waterdata.usgs.gov/tx/nwis/uv/?site_no=08459000&PARAmeter_cd=00065,00060

* IMPORTANT: Next Generation Station Page

USGS 08459000 Rio Grande at Laredo, TX

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site | Time-series: Current/Historical Observations | GO

Click to hide station-specific text

Data for this site is provided by the cooperators / programs below:

Select data courtesy of: US International Boundary & Water Commission

International Boundary and Water Commission

Advanced Hydrologic Prediction Service

Retransmission, forecasts and summary by the National Weather Service

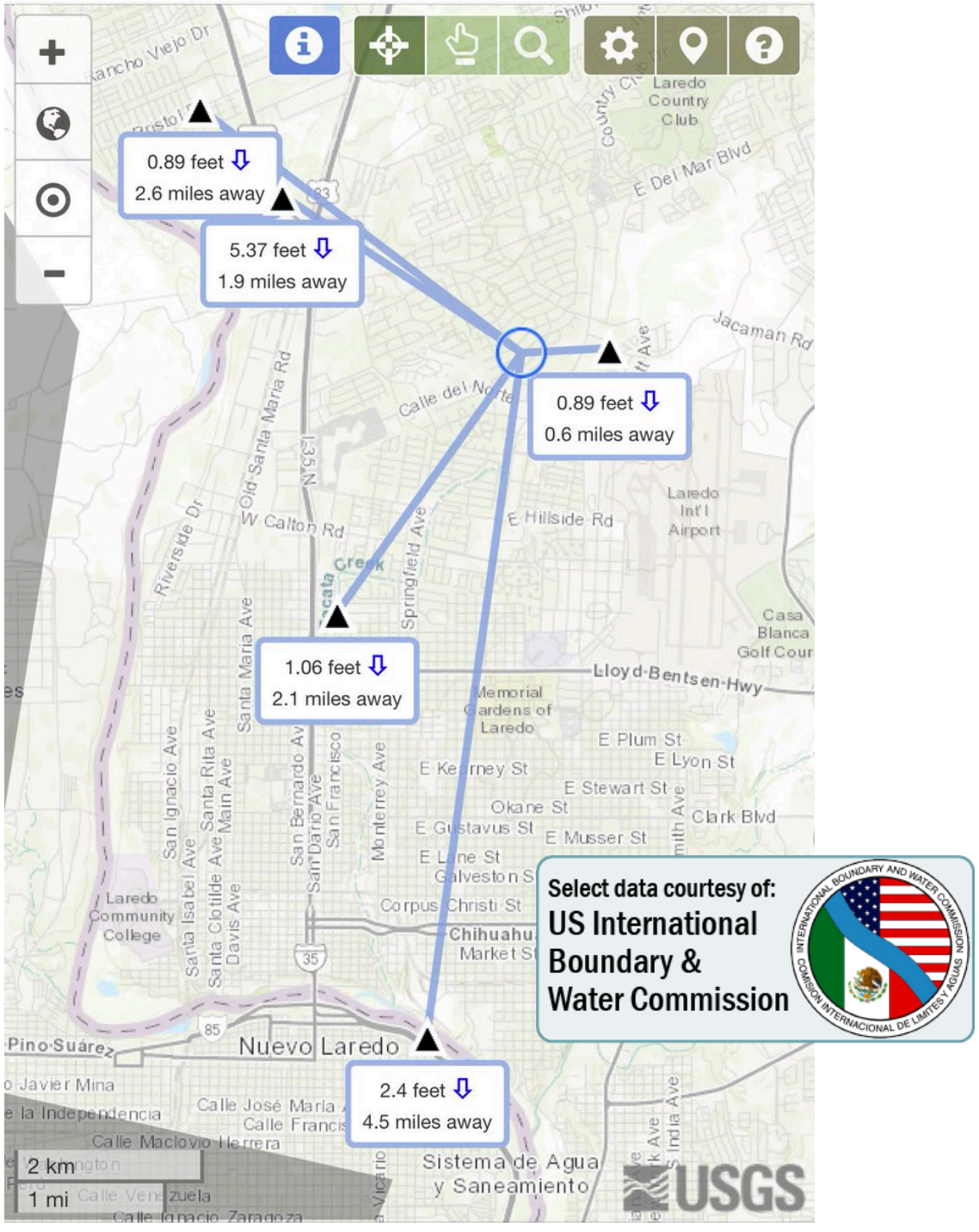
Current (most recent 120 days) International Boundary and Water Commission (IBWC) gage height and discharge data are provided as a courtesy to customers and stakeholders. For information about IBWC data or to obtain authoritative data, please contact IBWC.

*CREDIT/SOURCING

LAREDO, TX (USGS/IBWC)

New USGS streamgages in the City of Laredo have dramatically improved flood response. The Water On-the-Go app (shown right) uses your on-board GPS to show you what is happening in streams/lakes near you, and how conditions are changing.

More: https://txpub.usgs.gov/water-onthego/



OTHER AVAILABLE DATA?

EDWARDS AQUIFER AUTHORITY

LCRA ENERGY • WATER • COMMUNITY SERVICES

HARRIS COUNTY FLOOD CONTROL DISTRICT

US Army Corps of Engineers®

INTERNATIONAL BOUNDARY AND WATER COMMISSION
COMISION INTERNACIONAL DE LIMITES Y AGUAS

tra

Others?

USGS

FUTURE POTENTIAL

- National Dashboard (Twitter-model?)
- Delivery of other non-traditional data (next-gen NWIS 2.0)
  - Drone imagery
  - LSPIV (Large-scale Particle Velocimetry)
  - Water-use (irrigation)
  - Others?
- Expanding on use of NWIS as delivery vehicle (*not repo) for partner data (IoW)
- NGWOS Next-Gen Priority Basins
- Exploring real-time API to query by basin, county, custom AOI (personalized Dashboard)

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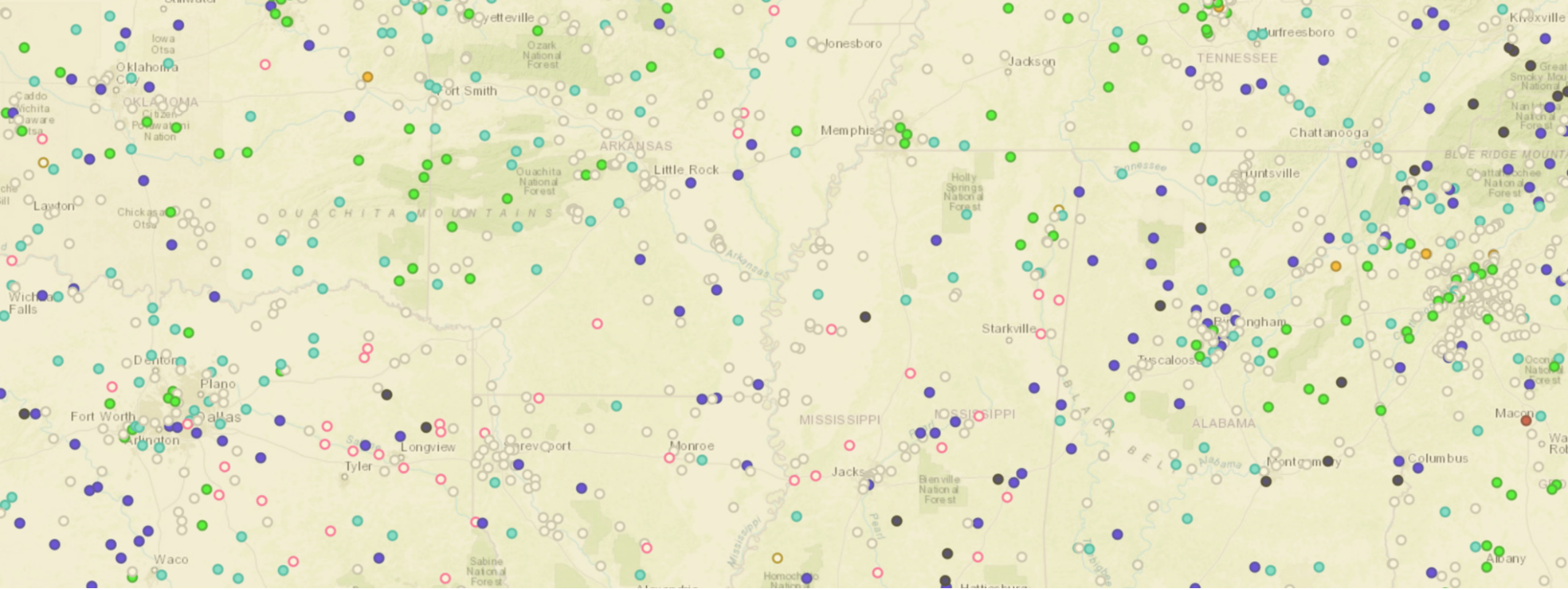

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